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IS 439 (1989): Industrial Coke [PCD 7: Solid Mineral Fuels]



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Indian Standard
INDUSTRIAL COKE—SPECIFICATION
(Third Revision)

भारतीय मानक
औद्योगिक कोक — विशिष्ट
(तीसरा पुनरीक्षण)

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**AMENDMENT NO. 1 JUNE 2011
TO
IS 439 : 1989 INDUSTRIAL COKE — SPECIFICATION**

(Third Revision)

(Page 2, Table 1) — Insert the following Note below Table 1:

NOTE — Low Ash Metallurgical Coke (LAM Coke) is the solid product of carbonization of coal/coal blends at temperature above 900°C. This includes blast furnace coke and foundry coke having ash content less than 15 percent.'

(PCD 7)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards on 22 December 1989, after the draft finalized by the Solid Mineral Fuels Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 1953 under the title 'Specification for hard coke for marketing' and was revised in 1965 and 1976. In the second revision the series of standards on coke for specific purposes were withdrawn and a consolidated standard on coke was formulated.

In the present version only the requirements of coke have been retained and details of methods for determination of ash fusion temperature and reactivity of coke have been excluded since these are covered in separate standards. Besides, new grades have been incorporated in the case of coke for gas making (GC) and coke for ferro-alloys industry (FAC) and in the case of foundry coke (FC) existing grades have been modified, accommodating cokes with higher ash content in view of the prevailing conditions in the industry. No changes have been made in the case of blast furnace coke (BFC) for the present.

In the formulation of this standard, due weightage has been given to International coordination among the standards and practices prevailing in different countries in addition to relating it to the practice in the field in this country. This has been met by deriving assistance from investigations carried out at the Central Fuel Research Institute (CSIR), Dhanbad.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INDUSTRIAL COKE—SPECIFICATION

(*Third Revision*)

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for industrial coke suitable for use in blast furnaces, foundries, gas producers and ferro-alloys industry.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
436 (Part 2) : 1965	Methods for sampling of coal and coke: Part 2 Sampling of coke (<i>revised</i>)
437 : 1979	Size analysis of coal and coke for marketing (<i>third revision</i>)
460 (Part 1) : 1985	Test sieves: Part 1 Wire cloth test sieves (<i>third revision</i>)
1350 (Part 1) : 1984	Methods of test for coal and coke: Part 1 Proximate analysis (<i>second revision</i>)
1350 (Part 3) : 1969	Methods of test for coal and coke: Part 3 Determination of sulphur (<i>first revision</i>)
1350 (Part 5) : 1979	Methods of test for coal and coke: Part 5 Special impurities (<i>first revision</i>)
1354 : 1964	Methods of test for coke—Special tests (<i>revised</i>)
3810 (Part 3) : 1977	Glossary of terms relating to solid mineral fuels: Part 3 Coke
4023 : 1989	Methods for the determination of reactivity of coke (<i>revised</i>)
12891 : 1990	Method of determination of fusibility of ash of coal, coke and lignite

3 DESIGNATION AND GRADES

3.1 Designations

Industrial coke for various uses shall be

designated as follows:

<i>Industrial Coke</i>	<i>Designation</i>
Blast furnace coke	BFC
Foundry coke	FC
Coke for gas making	GC
Coke for ferro-alloys industry	FAC

3.2 Grades

Coke shall be of four grades, namely, **Special Grade**, **Grade 1**, **Grade 2** and **Grade 3**, based on ash content (*see* Table 1).

4 REQUIREMENTS

4.1 Coke shall conform to the requirements prescribed in Table 1 when tested in accordance with the following methods:

- a) *Ash Moisture and Volatile Matter*, IS 1350 (Part 1) : 1984
- b) *Sulphur Content*, IS 1350 (Part 3) : 1969
- c) *Phosphorus Content*, 5 of IS 1350 (Part 5) : 1979
- d) *Shatter Index*, 3 of IS 1354 : 1964
- e) *Micum Index*, 4 of IS 1354 : 1964
- f) *Porosity*, 8 of IS 1354 : 1964
- g) *Temperature of Fusion of Ash*, IS 12891 : 1990
- h) *Reactivity to CO₂*, IS 4023 : 1989

4.2 Size Ranges

Size ranges for coke for various purposes at the point of loading ex-plant shall be as specified in col 17 of Table 1 [*see also* IS 460 (Part 1) : 1985].

5 SAMPLING

5.1 Representative samples of coke shall be drawn as prescribed in IS 436 (Part 2) 1965.

NOTE—In the case of blast furnace coke, the samples shall be drawn from the skip or from a point immediately before the skip. In case it is not possible to draw it from the skip, the representative samples shall first be drawn from the wharf and then conditioned for stabilization as prescribed in Annex A.

Table 1 Requirements for Industrial Coke

(Clauses 3.2, 4.1 and 4.2)

Sl No.	Coke Designation	Grades	Ash Per-cent, Max	Mois-ture, Per-cent, Max	Vola-tile Matter, Per-cent, Max	Sul-phur, Per-cent, Max	Phos-phorus, Per-cent, Max	Shatter Index		Micum Index		Porosity, Per-cent	Temperature (°C) of Ash Fusion (Under Mildly Reducing Atmosphere)		Reactivity to CO ₁	Size Range
								Over 50 mm	Over 12.5 mm	+40 mm Min	-10 mm Max		Initial Deformation	Fusion		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
2	i) Blast furnace coke (BFC)	1	22	4	1.5	0.7	0.25	—	—	78	10	38 to 45	—	—	—	The material shall be in the size range between 100 and 25 mm with a size tolerance of 5 percent by mass for oversize and 10 percent by mass for undersize
		2	25	4	1.5	0.7	0.25	—	—	76	12	38 to 45	—	—	—	
	ii) Foundry coke (FC)	Special	20	4	2.0	0.7	0.15	90	96	—	—	35 to 45	—	—	—	Size of coke shall be as agreed to between the purchaser and the supplier (see also IS 437 : 1979)
		1	25	4	2.0	0.7	0.3	85	95	—	—	35 to 45	—	—	—	
		2	30	4	2.0	0.7	0.3	80	94	—	—	35 to 45	—	—	—	
		3	35	4	2.0	0.7	0.3	75	92	—	—	35 to 45	—	—	—	
	iii) Coke for gas making (GC)	1	22	6	3.0	0.7	0.3	—	—	—	—	40 Min	>1240	>1350	—	Coke for producer and water gas manufacture shall be of the size range between 50 and 6.3 mm with a size tolerance of 5 percent by mass on oversize and 10 percent by mass on undersize
		2	25	6	3.0	0.7	0.3	—	—	—	—	40 Min	>1240	>1350	—	
		3	30	6	3.0	0.7	0.3	—	—	—	—	40 Min	>1240	>1350	—	
	iv) Coke for Ferroalloys industry (FAC)	Special	20	5	2.0	0.7	0.04	—	—	—	—	—	—	—	180	The material shall be in 2 size ranges, namely between 50 and 20 mm; and between 20 and 6.3 mm
		1	22	5	3.0	0.7	0.10	—	—	—	—	—	—	—	150	
		2	25	5	3.0	0.7	0.16	—	—	—	—	—	—	—	120	
		3	30	5	3.0	0.7	0.16	—	—	—	—	—	—	—	120	

ANNEX A
(Clause 5.1, Note)

METHODS OF STABILIZING COKE

A-0 GENERAL

A-0.1 In case when the sample of coke has to be drawn from the coke wharf, as in the case of merchant cokerries, pre-treatment of the same is necessary to bring it to the approximate condition it would have attained in its movement from the wharf to the blast furnace end.

A-1 APPARATUS

A-1.1 The equipment used is similar to that prescribed for 'shatter test' in 3 and Fig. 1 of IS 1354 : 1964.

A-2 PROCEDURE

A-2.1 Collect about 400 kg of coke above 50 mm in size and divide in 8 lots of 50 kg each. Fill

the box with a lot of 50 kg coke carefully placing in it each lump by hand. Raise the box to the height of 2 metres, close and latch the front plate of the base and displace the latch of the box to allow the coke to fall on the base plate. Repeat the above procedure with the same sample. Then place the coke in lots of 50 kg each into the micum test drum and rotate the drum for one minute making 25 revolutions. Screen the coke thus treated through a 50 mm square hole sieve and reject the material passing through it. Then screen the coke retained on the 50 mm sieve further through 125, 100 and 75-mm sieves and draw samples for physical tests, from the graded coke as prescribed in IS 436 (Part 2) : 1965.

NOTE — The treatment of dropping coke sample twice from a height of 2 m is to be given to all the 8 lots of 50 kg each separately.

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